

App. No.: 10/605843
Filed: October 30, 2003
Conf. No.: 2842

Page 2 of 7

IN THE CLAIMS

1.(Previously Amended) A method of preventing reverse rotation in a spark ignited internal combustion engine having at least one spark plug fired by an ignition circuit and having an electrical generator driven by the engine and a starting device for cranking the engine for starting thereof, said method comprising the steps of permitting firing of the spark plug after the starting device is initially operated, determining after the starting has been initiated if the speed of the engine has decreased from a previously sensed speed sufficiently that the engine may be starting to rotate in a direction opposite to that desired, and thereafter preventing firing of the spark plug.

2.(Original) The method as set forth in claim 1, wherein once the firing of the spark plug has been prevented the spark plug is not permitted to fire again until another starting operation is initiated.

3. (Original) The method as set forth in claim 1, wherein the speed of the engine is detected by the output of an electrical generator driven by the engine.

4. (Original) The method as set forth in claim 3, wherein the firing of the spark plug upon starting is not permitted until the speed of the engine reaches a predetermined first value.

5. (Original) The method as set forth in claim 4, wherein the firing of the spark plug is prevented when the speed of the engine falls below a second predetermined value lower than the first predetermined value.

6.(Original).The method as set forth in claim 5, wherein once the firing of the spark plug has been prevented the spark plug is not permitted to fire again until another starting operation is initiated.

7. (Original) The method as set forth in claim 1, wherein the engine ignition system includes a timing mark driven by an engine shaft and a pulser coil for providing an output signal in response to the position of the timing mark to determine the time of firing the engine and the ignition of the spark plug is not permitted until the pulser coil outputs a first signal.

8. (Original) The method as set forth in claim 7, wherein the speed of the engine is detected by the output of an electrical generator driven by the engine.

9. (Original) The method as set forth in claim 8, wherein the firing of the spark plug upon starting is not permitted until the speed of the engine reaches a predetermined first value.

10. (Original) The method as set forth in claim 9, wherein the firing of the spark plug is prevented when the speed of the engine falls below a second predetermined value lower than the first predetermined value.

App. No.: 10/605843
Filed: October 30, 2003
Conf. No.: 2842

Page 3 of 7

11. (Original) The method as set forth in claim 10, wherein once the firing of the spark plug has been prevented the spark plug is not permitted to fire again until another starting operation is initiated.

12. (Original) An ignition and anti reverse running system for an internal combustion engine comprising a pulser coil for generating a pulse in response to the passage of a timing mark associated with a shaft driven by the engine, an ignition circuit for receiving the pulse and initiating the firing of a spark plug of the engine, an ignition preventing circuit for preventing the firing of the spark plug by said ignition circuit when the speed of the engine falls below a predetermined speed after the engine has been initially cranked for starting thereof.

13. (Original) An ignition and anti reverse running system as set forth in claim 12, wherein the engine drives an electrical generator and the speed of the engine is determined by the output of said electrical generator.

14. (Original) An ignition and anti reverse running system as set forth in claim 13, wherein the ignition circuit is prevented from firing the spark plug by the ignition preventing circuit until the speed of the engine reaches a predetermined first value and the firing of the spark plug is prevented when the speed of the engine falls below a second predetermined value lower than said first predetermined value.

15. (Original) An ignition and anti reverse running system as set forth in claim 12, wherein the electrical generator has a plurality of phases and the speed of the engine is determined by a summing circuit that sums the output of at least two of said phases.

16. (Original) An ignition and anti reverse running system as set forth in claim 15, wherein the summing circuit comprises reverse current preventing diodes each receiving the output of a respective phase of the electrical generator, a capacitor charged by the electrical generator output, and a resistor connected between the capacitor and a reverse revolution discriminating circuit.

17. (Original) An ignition and anti reverse running system as set forth in claim 16, wherein the reverse revolution discriminating circuit comprises a flip-flop circuit connected to a pulse receiving circuit receiving the output of the pulser coil and a transistor circuit connected between said flip-flop circuit and the resistor of the summing circuit.

18. 11, (Original) The method as set forth in claim 10, wherein once the firing of the spark plug has been prevented the spark plug is not permitted to fire again until another starting operation is initiated.

12. (Original) An ignition and anti reverse running system for an internal combustion engine comprising a pulser coil for generating a pulse in response to the passage of a timing mark associated

App. No.: 10/605843
Filed: October 30, 2003
Conf. No.: 2842

Page 4 of 7

with a shaft driven by the engine, an ignition circuit for receiving the pulse and initiating the firing of a spark plug of the engine, an ignition preventing circuit for preventing the firing of the spark plug by said ignition circuit when the speed of the engine falls below a predetermined speed after the engine has been initially cranked for starting thereof.

13. (Original) An ignition and anti reverse running system as set forth in claim 12, wherein the engine drives an electrical generator and the speed of the engine is determined by the output of said electrical generator.

14. (Original) An ignition and anti reverse running system as set forth in claim 13, wherein the ignition circuit is prevented from firing the spark plug by the ignition preventing circuit until the speed of the engine reaches a predetermined first value and the firing of the spark plug is prevented when the speed of the engine falls below a second predetermined value lower than said first predetermined value.

15. (Original) An ignition and anti reverse running system as set forth in claim 12, wherein the electrical generator has a plurality of phases and the speed of the engine is determined by a summing circuit that sums the output of at least two of said phases.

16. (Original) An ignition and anti reverse running system as set forth in claim 15, wherein the summing circuit comprises reverse current preventing diodes each receiving the output of a respective phase of the electrical generator, a capacitor charged by the electrical generator output, and a resistor connected between the capacitor and a reverse revolution discriminating circuit.

17. (Original) An ignition and anti reverse running system as set forth in claim 16, wherein the reverse revolution discriminating circuit comprises a flip-flop circuit connected to a pulse receiving circuit receiving the output of the pulser coil and a transistor circuit connected between said flip circuit and the resistor of the summing circuit.

18. (Newly Added) A method for preventing a reverse rotation of an engine, comprising: determining if a predetermined monitoring condition for monitoring a reverse rotation of the engine is satisfied; determining if an operation of a starter motor has stopped, when the monitoring condition is satisfied; determining if the reverse rotation of the engine is occurring, when the operation of the starter motor has stopped; and stopping an operation of the engine by stopping at least one of fuel injection and ignition of the engine when the reverse rotation of the engine is occurring.

19. (Newly Added) A method for preventing a reverse rotation of an engine as set forth in claim 18 wherein if the speed of the engine has decreased from a previously sensed speed sufficiently that the engine may be starting to rotate in a direction opposite to that desired the operation of the engine is stopped.

App. No.: 10/605843
Filed: October 30, 2003
Conf. No.: 2842

Page 5 of 7

20. (Newly Added) The method as set forth in claim 19, wherein once the engine has been stopped the engine is not permitted to run again until another starting operation is initiated.

21. (Newly Added) The method as set forth in claim 19, wherein the speed of the engine is detected by the output of an electrical generator driven by the engine.

22. (Newly Added) The method as set forth in claim 21, wherein the operation of the engine upon starting is not permitted until the speed of the engine reaches a predetermined first value.

23. (Newly Added) The method as set forth in claim 22, wherein the firing of the operation of the engine is prevented when the speed of the engine falls below a second predetermined value lower than the first predetermined value.